FORMATION ENVIRONMENTAL

June 20, 2012

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Oregon Department of Environmental Quality
Northwest Region
2020 SW 4th Avenue, #400
Portland, Oregon 97201

RE: Response to DEQ March 2, 2012 Letter, Willamette Cove Upland Facility Residual Risk Assessment

Dear Ken:

This letter was prepared in response to your letter to Dwight Leisle, Port of Portland on March 2, 2012 regarding the Residual Risk Assessment (RRA) for the Willamette Cove Upland Facility. The original DEQ comments from the March 2 letter are presented below, along with the Port's response, which includes subsequent discussions with DEQ. The responses below were prepared by Formation Environmental on behalf of the Port of Portland. We assume that these responses, combined with the attached tables and figures are sufficient for the Port to begin preparation of the RRA, and no other planning documents (e.g., work plans) are needed. The Port will also proceed with submittal of a revised work plan for sampling the former Wharf Road, as agreed to in the responses below.

Screening Out COIs

1. DEQ Comment: *The main body of the risk assessment should be conducted without removing contaminants of interest (COIs) on the basis of frequency of detection. Frequency of detection screening should be limited to contaminant detections that are believed to be erroneous and not supported by other lines of evidence. Discussion of the results or risk estimates derived from infrequently detected chemicals can be discussed in the uncertainty section of the residual risk assessment.*

Response: The Port will provide a new screen which will show results that are independent of detection frequency and will include the new screen in the main body of the risk assessment document.

Inner Cove Beach Area:

2. DEQ Comment: *The Oregon Environmental Health Assessment Program, Office of Environmental Public Health, is preparing a Health Consultation for contaminants found at Willamette Cove. DEQ anticipates reviewing this document in March 2012.*

Response: The Health Consultation will be reviewed and incorporated as supplemental information for the Residual Risk Assessment.

3. DEQ Comment: *The inner cove beach is indicated as an area of unacceptable risk in the Lower Willamette Group (LWG) baseline ecological risk assessment* [BERA] *report to shorebirds for Total PCBs (HQ of 20) and copper. Please acknowledge this finding in the Residual Risk Assessment.*

Response:
The shorebird receptor will be acknowledged in the RRA. Note however, that the specific results from the Portland Harbor (PH) BERA that DEQ cites in the comment include in-water sediment and invertebrate tissue collected from offshore. Inclusion of these pathways in assessment for the Willamette Cove Upland Facility is inconsistent with previous instructions from DEQ. (*See discussion below on scope of the risk assessments*).

The Port will also cite the results of the PH Remedial Investigation/Feasibility Study (PH RI/FS) for the Human Health Risk Assessment (HHRA) for both beach units. The pathways included in the beach exposure scenario for the PH RI/FS HHRA are more consistent with previous instructions from DEQ for the Willamette Cove Upland Facility.

The Port and Metro acknowledge DEQ's concern that risk analysis be completed for the beach units at the Willamette Cove site, and have tried to be responsive by attempting to address these concerns in proposed changes to the risk assessment. However, assessment of risk for the beaches appears to be outside the scope of the Voluntary Agreement for the Willamette Cove Upland Facility (i.e., they are below the mean high water mark [MHWM]). Both beaches were explicitly addressed in the PH RI/FS. The Port and Metro recognize that further investigation and analysis of risks for the inner cove area below the MHWM may be necessary during the design of the in-water remedy for the Willamette Cove Sediment Management Area. The Port and Metro agree to include these units in the RRA document, but wish to make the distinction between them and the areas explicitly identified in the Voluntary Agreement for the Willamette Cove Upland Facility.

Note: An "in-water" data point is included on Figure 3 and Table 4 and is intended to represent the Central Beach Exposure Unit. This "in-water" location is labeled LW2-B015. Although this point plots "in the water" based on coordinates in the LWG database, this sample is a "Round 2a beach sediment composite" from 2004 and corresponds to the sampling area called "Beach Area B14", which was specifically added to the RRA dataset at the request of DEQ in the letter dated Feb 2, 2012 (See also Comment #5 below.) .

Exposure Units

4. DEQ Comment: *Upland samples collected at different soil depth intervals should not be averaged at a given sample location, but treated as independent data points for developing exposure point concentrations.*

Response: DEQ's request to treat multiple samples from the same location as independent data points is likely an inappropriate statistical procedure since that process would "double-count" data from sampling locations, which invalidates assumptions of independence required as the basis for statistical evaluations such as 90 percent upper-confidence level calculations.

The Port and Metro understand that the DEQ comment comes from the DEQ Human Health Risk Assessment Guidance dated October 2010 (page 14) and that data should be treated in a way that best represents the EPC being evaluated. The Port/Metro proposal is therefore as follows: Data listed as having the same sampling location ID and are from sampling depths that fall within the depth intervals specified in the risk assessment will be treated as one location and averaged for calculating exposure point concentrations (EPCs). For example, if 3 separate samples are available from one location (i.e., have the same location ID), and all three samples are from depths less than 3 feet below ground surface (bgs), the three will be averaged for estimating EPCs. Such averaging would not include samples from the same location, but from depths outside the target interval for the risk assessment (e.g., for this example, deeper than 3 feet bgs). If data are labeled as having separate location IDs, then data will be treated as independent observations.

DEQ has instructed the Port to include the Trench 3/4 and Trench 4B in surface soil results. This sample is from the bottom of a sampling trench that was dug to assess the potential for subsurface transport of contaminants. Since the sample is from 8 feet bgs, it does not represent surface exposures. However, no surface samples are available the area of Trench 4, DEQ wants the location represented in exposure calculations. Samples from Trench 3/4 and Trench 4B will be included in the surface exposure calculations, with uncertainties discussed as appropriate.

5. DEQ Comment: *The current proposal for inclusion of samples in the upland exposure unit is inconsistent across the site. For example, in the wharf road area beach samples are included in the upland exposure unit, while in the inner cove upland samples are included in the beach exposure unit. The mean high water line should be used as the boundary to define upland exposure units. Any sample generally at or above mean high water should be included in the upland exposure unit. These samples are representative of upland soil and it is reasonable that human and ecological receptors (using upland exposure scenarios) would be exposed to these soils. Please modify the tables as follows:*

Table 2, Central Parcel Exposure Unit Surface Soil Samples: Samples WC-SSV-1-1, WC-SSV-1-2, WC-SSX Comp., WC-SSD, WC-SSE-1, WC-SSE-2, WC-SSE-3, WC-SSE-4, WC-SSE Comp., SS-6 and SS-5 should be added to the upland exposure unit. Wharf Road beach samples DL-1, DL-2, DL-3 and Wharf Beach-1 should be removed from the upland exposure unit (Table 2) and added to Table 5 (Inner Cove Beach Exposure Unit). The beach areas are feature-specific and do not necessarily fall within upland exposure units.

Table 3, East Parcel Exposure Unit Surface Soil Samples: Samples WC-SSH-3, WC-SSH-4, WC-SSH-A, WC-SSH-B, WC-SSH-C, WC-SSH-SHSI, WC-SSI, WC-SSJ, WC-SSL-1 Comp., WC-SSL-1-1, WC-SSL-1-2, WC-SSL-1-3, WC-SSL-1-4, WC-SSL-2 Comp., WC-SSL-2-1, WC-SSL-2-2, WC-SSL-2-3, WC-SSL-2-4 and WC-SSM Comp. should be added to the upland exposure unit.

Table 4, West Central Parcel Beach Exposure Unit Surface Soil Samples: Please add LWG samples 6B026 and B14 (LWG 2011) to the beach exposure unit.

Table 5, Inner Cove Beach Exposure Area: HA-8, HA-9, HA-1O and HA-11 should be removed entirely since they are under the McCormick and Baxter Sediment Cap. Beach sample B15 (LWG 2011) should be added to the inner cove beach exposure unit. Where only dioxin-like PCBs were analyzed, please present associated PCB TEQ data in the risk assessment compared to 2,3,7,8-TCDD risk levels. Total TEQ (sum of dioxin TEQ and PCB TEQ) should also be presented where both analyses are available.

Response: The specific changes cited in the DEQ comment above can be accommodated. New data tables and maps, as requested by DEQ, are attached to this response letter. However, for the record, we disagree that the sampling location assignments as presented in the proposal for the RRA were inconsistent. The intent of the Port's initial proposal was to accommodate the DEQ concerns that we cited in the response to Comment #3 above. Despite the apparent inconsistencies with the Voluntary Agreement, the Port attempted to address this concern in two ways. First, to address concerns that the area below the MHWM would be excluded from risk assessment for upland receptors, we proposed to extend the Upland Parcel exposure units to the ordinary line of low water (OLLW). Second, to make sure that

all 'beach' areas were included in the Beach exposure units, we identified sampling locations that appeared to be in sandy beach areas, based on examination of aerial photos. This approach resulted in overlap of the Beach and Upland exposure units in some areas, but allowed us to incorporate all data available from beach areas.

Please note that the "Beach sample B15" referenced by DEQ is a sampling *area* and the corresponding sample, 06B022, was already included in Table 5 (Inner Cove Beach Exposure Area). Additionally, DEQ references "sample B14" which is also a beach sampling *area* in the West Central Parcel Beach Exposure Unit. The corresponding sample for this location is B015 and both this location and location 06B026 were added to Table 4.

[*The following additional comments and requests submitted from DEQ will be made in figures and tables:*

It appears from the figures that some available sampling points on the two sandy beaches and the lower wharf road area have been omitted.

Central Parcel Beach: Sample points SS-5, SS6, SSH-D, WC SSE comp, WCSSE 1through4 and WC-SSX should be retained in the central parcel beach exposure unit (in addition to inclusion in the upland exposure unit).

Inner Cove Beach: Please remove WC-SSM, SSH-B and SSH-C from the beach exposure unit. These samples better represent the East Parcel Upland Exposure Unit. WC SSH-D should be also removed as this sample is represented in the Central Parcel Upland / Beach exposure units.]

Wharf Road Samples

6. DEQ Comment: *The proposed incremental sample decision units should be shifted such that the riverward side of the units is at the mean high water line.*

Response: This shift would result in large portions of the two most riverward sampling units being on the rip-rap covered areas of the riverbank. Collecting surface soil samples in this area will be difficult to impracticable and potentially unsafe (due to the thickness of the rip-rap and the steepness of the slope). In addition, the potential for exposure in such areas seems to be fundamentally different than surface soils in flatter, more accessible areas uphill of the rip-rap. The rip-rap covers the soils and the presence of the rip-rap would reduce or prevent the level of contact assumed in the exposure scenarios. Exclusion of the rip-rapped areas would be consistent with the Interstate Technology Regulatory Council guidance (2012). Therefore, the Port proposes that the riverward edge of the MIS

sampling units be at the upland edge of the rip-rapped slope, and the sampling unit be configured to cover the area of concern for the dioxins.

The lower margin of the decision units will begin at the approximate MHWM. Additional details will be provided in the revised surface sampling letter for the Wharf Road area.

Trespasser Assumptions

7. DEQ Comment*: We concur with your suggestion to revise the transient trespasser exposure frequency assumption from 104 days/year to 208 days/year. However, we do not agree that site use by nearby local residents (including cyclists, runners, dog walkers, and beach users) results in minimal exposure. Also, weekly patrols are unlikely to deter regular site use by local residents. In addition to the transient scenario, include a scenario for regular recreational (trespasser) use. The exposure frequency of 104 days/year is adequate. For regular recreational users, use the default residential exposure duration assumption of 30 years (6 years as a child, 24 years as an adult).*

Response: An exposure scenario will be added to accommodate assessment of Recreational Trespasser with an exposure frequency of 104 days/year, exposure duration of 30 years (6 years as a child, 24 years as an adult).

Inner Cove Beach Area

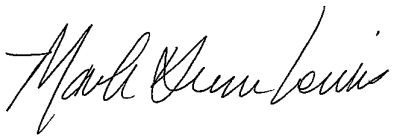
8. DEQ Comment*: In order to address the uncertainty of exposure point concentrations in the inner cove, exposure point concentrations should be derived in two ways and the risk ranges presented in the risk assessment:*

1. Using Table 5 with the above comments.
2. The use of Table 5 data in conjunction with the trench samples representing 0 to 4 and 8 foot depths. Since surface data were not collected in these trench locations, the deeper data should be used to fill this data gap.

Response: The subsurface samples cited in the comment will be included in the RRA for the Inner Cove Beach Exposure unit, as directed. The risk characterization will identify the uncertainty associated with this assumption, as well as other assumptions adopted for the RRA.

We look forward to implementing the RRA once the additional Wharf Road sampling has been completed. We will plan to meet with DEQ following receipt of the new Wharf Road data set prior to preparation of the RRA. Please don't hesitate to contact me (303.447.0267) or Dwight Leisle (503.415.6325) at the Port of Portland if you have any questions. Thank you.

Sincerely,



Mark C. Dunn Lewis, PhD
Formation Environmental

Encl: Maps and tables

cc:
Mike Poulsen, DEQ NWQ
Jennifer Peterson, DEQ NWQ
Katy Weil, Metro
Dwight Leisle, Port of Portland
Michael Pickering, Ash Creek Associates, Inc.
Amanda Spencer, Ash Creek Associates, Inc.

TABLES

Table 1. West Parcel Upland Exposure Unit Surface Soil Samples - Residual Risk Assessment

Location	Sample	Sample Type	Sample Depth		Sample Date	Analytes Groups Evaluated													
			Minimum (ft)	Maximum (ft)		Aroclors	Conventionals	Dioxin_Furan Homolog	Dioxins_ Furans	Grainsize	Herbicides	Metals	PAHs	Pesticides	Petroleum	Phenols	Phthalates	SVOCs	VOCs
B-1	B-1/S-2	Discrete	2	4	5/8/2001							X			X				
B-2	B-2/S-1	Discrete	0	2	5/10/2001							X			X				
	B-2/S-2	Discrete	2	4	5/10/2001						X		X	X		X		X	X
B-6	B-6/S-1	Discrete	0	2	5/9/2001										X				
B-7	B-7/S-1	Discrete	0	2	5/9/2001										X				
B-8	B-8/S-2	Discrete	2	4	5/10/2001								X		X				
SS-1	SS-1	Discrete	0	0.5	1/17/2002								X						
SS-2	SS-2	Discrete	0	0.5	1/17/2002								X						
SS-3	SS-3	Discrete	0	0.5	1/17/2002								X						
SSA	WC-SSA	Discrete	0	0.5	12/21/2005	X													
SSB	WC-SSB	Discrete	0	0.5	12/21/2005	X													
TP-16	TP-16/S-1	Discrete	0	0.5	4/17/2001							X			X				
TP-17	TP-17/S-1	Discrete	0	0.5	4/17/2001							X			X				
	TP-17/S-2	Discrete	1.5	2	4/17/2001						X		X	X	X	X		X	X
TP-18	TP-18/S-1	Discrete	0	0.5	4/18/2001										X				
TP-19	TP-19/S-2	Discrete	1.5	2	4/18/2001								X		X				
TP-2	TP-2	Discrete	0	4	10/20/1995								X					X	X
TP-20	TP-20/S-1	Discrete	0	0.5	4/17/2001								X		X				
TP-21	TP-21/S-2	Discrete	1.5	2	4/17/2001								X		X	X	X	X	X
TP-3	TP-3	Discrete	0	3.8	10/19/1995	X						X	X					X	X

Notes:

Surface soil samples have depth intervals that start within 3 feet of the surface, but don't extend deeper than 4 feet.

Table 2. Central Parcel Upland Exposure Unit Surface Soil Samples- Residual Risk Assessment

Location	Sample	Sample Type	Sample Depth		Sample Date	Analytes Groups Evaluated													
			Miniumum (ft)	Maximum (ft)		Aroclors	Conventionals	Dioxin_Furan_ Homolog	Dioxins_ Furans	Grainsize	Herbicides	Metals	PAHs	Pesticides	Petroleum	Phenols	Phthalates	SVOCs	VOCs
B-12	B-12/S-1	Discrete	0	2	5/14/2001							X							
B-16	B-16/S-1	Discrete	0	2	5/7/2001							X	X		X				
B-17	B-17/S-1	Discrete	0	2	5/8/2001							X							
B-18	B-18/S-1	Discrete	0	2	5/7/2001							X		X					
B-20	B-20/S-2	Discrete	2	4	5/7/2001										X				
HA-6	HA-6/S-1	Discrete	0	0.5	5/18/2001	X							X		X	X	X	X	X
	HA-6/S-3	Discrete	1	2	5/18/2001										X				
SS-5 [a]	SS-5	Discrete	0	0.5	1/17/2002							X							
SS-6 [a]	SS-6	Discrete	0	0.5	1/17/2002							X							
SS-10	SS-10	Discrete	0	0.5	1/17/2002								X		X				
SS-11	SS-11	Discrete	0	0.5	1/17/2002								X						
SS-12	SS-12	Discrete	0	0.5	1/17/2002							X							
SS-13	SS-13	Discrete	0	0.5	1/17/2002							X	X						
SS-14	SS-14	Discrete	0	0.5	1/17/2002							X	X						
SS-15	SS-15	Discrete	0	0.5	1/17/2002							X	X						
SS-16	SS-16	Discrete	0	0.5	1/17/2002								X						
SS-17	SS-17	Discrete	0	0.5	1/17/2002							X	X						
SS-18	SS-18	Discrete	0	0.5	1/17/2002							X	X						
SS-19	SS-19	Discrete	0	0.5	1/17/2002							X							
SS-23	SS-23	Discrete	0	0.5	1/17/2002								X						
SS-24	SS-24	Discrete	0	0.5	1/18/2002							X							
SS-26	SS-26	Discrete	0	0.5	1/18/2002							X							
SS-27	SS-27	Discrete	0	0.5	1/18/2002							X							
SS-28	SS-28	Discrete	0	0.5	1/17/2002								X						
SS-29	SS-29	Discrete	0	0.5	1/18/2002							X							
SS-30	SS-30	Discrete	0	0.5	1/18/2002							X							
SS-31	SS-31	Discrete	0	0.5	1/18/2002							X							
SS-4	SS-4	Discrete	0	0.5	1/17/2002								X						
SS-8	SS-8	Discrete	0	0.5	1/17/2002								X		X				
SS-9	SS-9	Discrete	0	0.5	1/17/2002								X		X				
TP-10	TP-10	Discrete	0	2.8	10/19/1995							X							
TP-22	TP-22/S-1	Discrete	0	0.5	4/17/2001	X						X	X		X	X	X	X	X
TP-23	TP-23/S-1	Discrete	0	0.5	4/17/2001								X		X				
TP-24	TP-24/S-1	Discrete	0	0.5	4/17/2001								X		X				
TP-25	TP-25/S-1	Discrete	0	0.5	4/17/2001							X	X		X				
	TP-25/S-2	Discrete	1.5	2	4/17/2001							X							
TP-26	TP-26/S-1	Discrete	0	0.5	4/17/2001							X			X				
	TP-26/S-2	Discrete	1.5	2	4/17/2001								X					X	X
TP-27	TP-27/S-1	Discrete	0	0.5	4/17/2001							X	X	X	X				
	TP-27/S-2	Discrete	1.5	2	4/17/2001										X				
TP-28	TP-28/S-1	Discrete	0	0.5	4/17/2001										X				
TP-29	TP-29/S-1	Discrete	0	0.5	4/18/2001	X						X	X	X	X				
TP-31	TP-31/S-2	Discrete	1.5	2	4/16/2001							X	X					X	X
TP-33	TP-33/S-1	Discrete	0	0.5	4/16/2001							X	X		X				
TP-34	TP-34/S-1	Discrete	0	0.5	4/16/2001							X	X		X				
	TP-34/S-2	Discrete	1.5	2	4/16/2001							X			X				
TP-6	TP-6	Discrete	0	3	10/19/1995							X							
TP-7	TP-7	Discrete	0	0.5	10/19/1995	X						X							
TP-8	TP-8	Discrete	0	4	10/19/1995							X							
SSC	WC-SSC	Composite	0	0.5	12/21/2005								X						
SSD	WC-SSD	Composite	0	0.5	12/21/2005								X						
SSE [a]	WC-SSE	Composite	0	0.5	12/21/2005								X						
SSE-1 [a]	WC-SSE-1	Discrete	0	0.5	12/21/2005								X						
SSE-2 [a]	WC-SSE-2	Discrete	0	0.5	12/21/2005								X						
SSE-3 [a]	WC-SSE-3	Discrete	0	0.5	12/21/2005								X						
SSE-4 [a]	WC-SSE-4	Discrete	0	0.5	12/21/2005								X						
SSF	WC-SSF	Composite	0	0.5	12/21/2005	X													
SSG	WC-SSG	Composite	0	0.5	12/21/2005	X													

Table 2. Central Parcel Upland Exposure Unit Surface Soil Samples- Residual Risk Assessment

Location	Sample	Sample Type	Sample Depth		Sample Date	Analytes Groups Evaluated													
			Miniumum (ft)	Maximum (ft)		Aroclors	Conventionals	Dioxin_Furan_ Homolog	Dioxins_ Furans	Grainsize	Herbicides	Metals	PAHs	Pesticides	Petroleum	Phenols	Phthalates	SVOCs	VOCs
SSH-D [a]	WC-SSH-D	Discrete	0	0.5	12/27/2007	X													
SSH-E	WC-SSH-E	Discrete	0	0.5	12/27/2007	X													
SSH-F	WC-SSH-F	Discrete	0	0.5	12/27/2007	X													
WCP-1	WCP-1 (1.0)	Discrete	0.5	1	10/30/2007							X							
	WCP-1 (1.5)	Discrete	1	1.5	10/30/2007							X							
WCP-2	WCP-2 (1.0)	Discrete	0.5	1	10/30/2007							X							
	WCP-2 (1.5)	Discrete	1	1.5	10/30/2007							X							
WCP-3	WCP-3 (1.0)	Discrete	0.5	1	10/30/2007							X							
	WCP-3 (1.5)	Discrete	1	1.5	10/30/2007							X							
WCP-4	WCP-4 (1.0)	Discrete	0.5	1	10/30/2007							X							
	WCP-4 (1.5)	Discrete	1	1.5	10/30/2007							X							
WCP-5	WCP-5 (1.0)	Discrete	0.5	1	10/30/2007							X							
	WCP-5 (1.5)	Discrete	1	1.5	10/30/2007							X							
WCP-6	WCP-6 (1.0)	Discrete	0.5	1	10/30/2007							X							
	WCP-6 (1.5)	Discrete	1	1.5	10/30/2007							X							
WCP-7	WCP-7 (1.0)	Discrete	0.5	1	10/30/2007							X							
	WCP-7 (1.5)	Discrete	1	1.5	10/30/2007							X							
WCP-8	WCP-8 (1.0)	Discrete	0.5	1	10/30/2007							X							
	WCP-8 (1.5)	Discrete	1	1.5	10/30/2007							X							
WCP-9	WCP-9 (1.0)	Discrete	0.5	1	10/30/2007							X							
	WCP-9 (1.5)	Discrete	1	1.5	10/30/2007							X							
WC-SSP (Comp)	WC-SSP (Comp)-1	Composite	0	0.5	10/4/2010	X						X	X						
	WC-SSP (Comp)-2	Composite	2	2.5	10/4/2010							X	X						
WC-SSP-1	WC-SSP-1-1	Discrete	0	0.5	10/4/2010							X	X						
	WC-SSP-1-2	Discrete	2	2.5	10/4/2010							X	X						
WC-SSP-3	WC-SSP-3-1	Discrete	0	0.5	10/4/2010							X	X						
	WC-SSP-3-2	Discrete	2	2.5	10/4/2010							X	X						
WC-SSQ	WC-SSQ(Composite)	Composite	0	0.5	10/1/2010	X						X	X						
WC-SSR	WC-SSR(Composite)	Composite	0	0.5	10/1/2010	X						X	X						
WC-SSS	WC-SSS(Composite)	Composite	0	0.5	10/1/2010	X						X	X						
WC-SSS-1a	WC-SSS-1a	Discrete	0	0.5	10/1/2010							X							
WC-SSS-1b	WC-SSS-1b	Discrete	0	0.5	10/1/2010							X							
WC-SSS-2a	WC-SSS-2a	Discrete	0	0.5	10/1/2010							X							
WC-SSS-2b	WC-SSS-2b	Discrete	0	0.5	10/1/2010							X							
WC-SST (Comp)	WC-SST(Comp)-1	Composite	0	0.5	10/4/2010	X						X	X						
	WC-SST-(Comp)-2	Composite	1.5	2	10/4/2010							X	X						
WC-SST-1	WC-SST-1-1	Discrete	0	0.5	10/4/2010							X	X						
	WC-SST-1-2	Discrete	1.5	2	10/4/2010							X							
WC-SST-2	WC-SST-2-1	Discrete	0	0.5	10/4/2010							X	X						
	WC-SST-2-2	Discrete	1.5	2	10/4/2010							X							
WC-SSU	WC-SSU(Composite)	Composite	0	0.5	10/1/2010	X							X						
WC-SSV-1	WC-SSV-1-1	Discrete	0	0.5	10/4/2010	X						X							
	WC-SSV-1-2	Discrete	1.5	2	10/4/2010							X							
WC-SSW	WC-SSW(Composite)	Composite	0	0.5	10/4/2010	X													
WC-SSX [a]	WC-SSX(Composite)	Composite	0	0.5	10/4/2010	X							X						
WC-SSY	WC-SSY(Composite)	Composite	0	0.5	10/4/2010	X													
Wharf Road Area																			
WC-1	WC-1 Surface	Discrete	0.3	0.8	10/1/2010			X	X			X							
WC-1/2/3	WC-1/2/3	Composite	0.25	0.8	10/1/2010	X		X	X			X	X		X				
WC-2	WC-2 Surface	Discrete	0.25	0.75	10/1/2010			X	X			X							
WC-3	WC-3 Surface	Discrete	0.25	0.75	10/1/2010			X	X			X							

Notes:

Surface soil samples have depth intervals that start within 3 feet of the surface, but don't extend deeper than 4 feet.

Soil samples from areas excavated during the 2008 upland removal action are not included.

a - These samples will also be evaluated as part of the Central Beach Exposure Unit.

Table 3. East Parcel Upland Exposure Unit Surface Soil Samples - Residual Risk Assessment

Location	Sample	Sample Type	Sample Depth		Sample Date	Analytes Groups Evaluated													
			Minimum (ft)	Maximum (ft)		Aroclors	Conventionals	Dioxin_Furan_ Homolog	Dioxins_ Furans	Grainsize	Herbicides	Metals	PAHs	Pesticides	Petroleum	Phenols	Phthalates	SVOCs	VOCs
B-21	B-21/S-1	Discrete	0	4	5/7/2001						X		X	X	X	X		X	X
B-22	B-22/S-1	Discrete	0	2	5/15/2001										X				
B-23	B-23/S-1	Discrete	0	2	5/15/2001							X							
B-24	B-24/S-1	Discrete	0	4	5/17/2001										X				
B-25	B-25/S-2	Discrete	2	4	5/7/2001										X				
B-26	B-26/S-1	Discrete	0	2	5/11/2001								X	X	X				
B-27	B-27/S-1	Discrete	0	2	5/11/2001							X		X					
	B-27/S-2	Discrete	2	4	5/11/2001								X					X	X
B-28	B-28/S-1	Discrete	0.5	1	5/17/2001								X		X				
B-29	B-29/S-1	Discrete	0	4	5/17/2001										X				
B-30	B-30/S-1	Discrete	0	4	5/17/2001										X				
SR3	SR3	Discrete	0	0.2	10/4/1991		X					X	X			X		X	
SR4	SR4	Discrete	0	0.2	10/4/1991		X					X	X			X		X	
SS-32	SS-32	Discrete	0	0.5	1/17/2002								X						
SS-34 [a]	SS-34	Discrete	0	0.5	1/18/2002							X							
SS-36	SS-36	Discrete	0	0.5	1/18/2002									X					
SS-37	SS-37	Discrete	0	0.5	1/18/2002									X					
SS-38	SS-38	Discrete	0	0.5	1/18/2002									X					
SSH	WC-SSH	Composite	0	0.5	12/21/2005	X													
SSH-1	WC-SSH-1	Discrete	0	0.5	12/21/2005	X													
SSH-2	WC-SSH-2	Discrete	0	0.5	12/21/2005	X													
SSH-3	WC-SSH-3	Discrete	0	0.5	12/21/2005	X													
SSH-4	WC-SSH-4	Discrete	0	0.5	12/21/2005	X													
SSH-A	WC-SSH-A	Discrete	0	0.5	12/27/2007	X													
SSH-B	WC-SSH-B	Discrete	0	0.5	12/27/2007	X													
SSH-C	WC-SSH-C	Discrete	0	0.5	12/27/2007	X													
SSH-G	WC-SSH-G	Discrete	0	0.5	12/27/2007	X													
SSH-H	WC-SSH-H	Discrete	0	0.5	12/27/2007	X													
SSH-SHS1	WC-SSH-SHS1	Discrete	2.5	3	4/21/2008	X													
SSH-SHS2	WC-SSH-SHS2	Discrete	2.5	3	4/21/2008	X													
SSI	WC-SSI	Composite	0	0.5	12/21/2005	X													
SSJ	WC-SSJ	Composite	0	0.5	12/21/2005	X													
SSK	WC-SSK	Composite	0	0.5	12/21/2005	X						X							
TP-11	TP-11	Discrete	0	3	10/19/1995								X					X	X
TP-15	TP-15	Discrete	0	4	10/19/1995											X			
TP-35	TP-35/S-1	Discrete	0	0.5	4/16/2001								X		X				
TP-36	TP-36/S-1	Discrete	0	0.5	4/16/2001						X	X			X	X			
TP-37	TP-37/S-1	Discrete	0	0.5	4/16/2001	X							X		X				
TP-38	TP-38/S-1	Discrete	0	0.5	4/16/2001						X					X			
	TP-38/S-2	Discrete	1.5	2	4/16/2001	X							X		X	X	X	X	X
TP-39	TP-39/S-2	Discrete	1.5	2	4/16/2001	X					X		X	X	X	X			
TP-40	TP-40/S-1	Discrete	0	0.5	4/16/2001						X				X	X			
WC-SSL-1	WC-SSL-1 Composite	Composite	0	0.5	9/28/2010	X						X	X						
WC-SSL-1-1	WC-SSL-1-1	Discrete	0	0.5	9/28/2010							X	X						
WC-SSL-1-2	WC-SSL-1-2	Discrete	0	0.5	9/28/2010							X	X						
WC-SSL-1-3	WC-SSL-1-3	Discrete	0	0.5	9/28/2010							X	X						
WC-SSL-1-4	WC-SSL-1-4	Discrete	0	0.5	9/28/2010							X	X						
WC-SSL-2	WC-SSL-2 Composite	Composite	0	0.5	9/30/2010	X						X	X						
WC-SSL-2-1	WC-SSL-2-1	Discrete	0	0.5	9/30/2010							X							
WC-SSL-2-2	WC-SSL-2-2	Discrete	0	0.5	9/30/2010							X							
WC-SSL-2-3	WC-SSL-2-3	Discrete	0	0.5	9/30/2010							X							
WC-SSL-2-4	WC-SSL-2-4	Discrete	0	0.5	9/30/2010							X							
WC-SSM	WC-SSM Composite	Composite	0	0.5	9/30/2010								X						
WC-SSN	WC-SSN Composite	Composite	0	0.5	9/30/2010							X	X						
WC-SSO	WC-SSO Composite	Composite	0	0.5	9/30/2010							X	X						
WC-SSO-1	WC-SSO-1	Discrete	0	0.5	9/30/2010							X							

Table 3. East Parcel Upland Exposure Unit Surface Soil Samples - Residual Risk Assessment

Location	Sample	Sample Type	Sample Depth		Sample Date	Analytes Groups Evaluated												
			Minimum (ft)	Maximum (ft)		Aroclors	Conventionals	Dioxin_Furan_ Homolog	Dioxins_ Furans	Grainsize	Herbicides	Metals	PAHs	Pesticides	Petroleum	Phenols	Phthalates	SVOCs	VOCs
WC-SSO-2	WC-SSO-2	Discrete	0	0.5	9/30/2010							X							
WC-SSO-3	WC-SSO-3	Discrete	0	0.5	9/30/2010							X							
WC-SSO-4	WC-SSO-4	Discrete	0	0.5	9/30/2010							X							
Trench 3 [a]	Trench 3	Discrete	8	8.5	9/28/2010	X													
Trench 3/4 [a]	Trench 3/4	Composite	8	8.5	9/29/2010	X						X	X		X			X	X
Trench 1/2 [a]	Trench 1/2	Composite	8	8.5	9/28/2010	X						X	X		X			X	X

Notes:

Surface soil samples have depth intervals that start within 3 feet of the surface, but don't extend deeper than 4 feet.

Three trench samples deeper than 4 feet are also included.

a - These samples will also be evaluated as part of the Inner Cove Beach Exposure Unit.

Table 4. Central Beach Exposure Unit Surface Soil Samples - Residual Risk Assessment

Location	Sample	Sample Type	Sample Depth		Sample Date	Analytes Groups Evaluated													
			Minimum (ft)	Maximum (ft)		Aroclors	Conventionals	Dioxin_Furan_Homolog	Dioxins_Furans	Grainsize	Herbicides	Metals	PAHs	Pesticides	Petroleum	Phenols	Phthalates	SVOCs	VOCs
06B026	06B026	Composite	0	0.5	10/4/2002	X	X			X	X	X	X	X		X	X	X	
B015[a]	LW2-B015	Composite	0	0.5	7/26/2004	X	X	X	X	X		X	X	X	X	X	X	X	
HA-5	HA-5/S-1	Discrete	0	0.5	4/18/2001							X			X				
SS-7	SS-7	Discrete	0	0.5	1/17/2002							X							
SS-5 [b]	SS-5	Discrete	0	0.5	1/17/2002							X							
SS-6 [b]	SS-6	Discrete	0	0.5	1/17/2002							X							
SSE [b]	WC-SSE	Composite	0	0.5	12/21/2005								X						
SSE-1 [b]	WC-SSE-1	Discrete	0	0.5	12/21/2005								X						
SSE-2 [b]	WC-SSE-2	Discrete	0	0.5	12/21/2005								X						
SSE-3 [b]	WC-SSE-3	Discrete	0	0.5	12/21/2005								X						
SSE-4 [b]	WC-SSE-4	Discrete	0	0.5	12/21/2005								X						
SSH-D [b]	WC-SSH-D	Discrete	0	0.5	12/27/2007	X													
WC-SSX [b]	WC-SSX(Composite)	Composite	0	0.5	10/4/2010	X							X						

Notes:

Surface soil samples have depth intervals that start within 3 feet of the surface, but don't extend deeper than 4 feet.

a - Sample was collected from LWG Beach sampling area B14.

b - These samples will also be evaluated as part of the Central Parcel Upland Exposure Unit.

Table 5. Inner Cove Beach Exposure Unit Surface Soil Samples - Residual Risk Assessment

Location	Sample	Sample Depth			Sample Date	Analytes Groups Evaluated													
		Sample Type	Minimum (ft)	Maximum (ft)		Aroclors	Conventionals	Dioxin_Furan _Homolog	Dioxins_ Furans	Grainsize	Herbicides	Metals	PAHs	Pesticides	Petroleum	Phenols	Phthalates	SVOCs	VOCs
06B022[a]	LWG0106B022SDS015C00	Composite	0	0.5	10/10/2002	X	X			X	X	X	X	X		X	X	X	
Beach Cove-1	Beach Cove-1	Discrete	1	1.5	9/27/2010	X						X	X		X			X	X
Beach Cove-2	Beach Cove-2	Discrete	1	1.5	9/27/2010	X						X	X		X			X	X
DL-1	DL-1	Discrete	1	1.5	9/17/2007							X	X		X				
DL-2	DL-2	Discrete	1	1.5	9/17/2007							X	X		X				
DL-3	DL-3	Discrete	1	1.5	9/17/2007							X	X		X				
EX-1	EX-1	Discrete	3	3	10/28/2004										X				
EX-2	EX-2	Discrete	3	3	10/28/2004										X				
EX-4	EX-4	Discrete	3	3	10/28/2004										X				
EX-5	EX-5	Discrete	3	3	10/28/2004										X				
HA-7	HA-7/S-2	Discrete	0.5	1	5/17/2001							X			X				
SS-33	SS-33	Discrete	0	0.5	1/18/2002							X							
SS-34 [b]	SS-34	Discrete	0	0.5	1/18/2002							X							
SS-35	SS-35	Discrete	0	0.5	1/18/2002							X							
TP-41	TP-41/S-1	Discrete	3	3	10/28/2004								X		X				
TP-42	TP-42/S-1	Discrete	3	3	10/28/2004								X		X				
TP-43	TP-43/S-1	Discrete	3	3	10/28/2004								X		X				
Wharf Beach -1	Wharf Beach -1	Discrete	1	1.5	9/27/2010	X		X	X			X	X		X			X	X
Trench 1/2 [b]	Trench 1/2	Composite	8	8.5	9/28/2010	X						X	X		X			X	X
Trench 3 [b]	Trench 3	Discrete	8	8.5	9/28/2010	X													
Trench 3/4 [b]	Trench 3/4	Composite	8	8.5	9/29/2010	X						X	X		X			X	X
Trench 4A	Trench 4A	Discrete	8	8.5	9/29/2010	X													
Trench 4B	Trench 4B	Discrete	8	8.5	9/29/2010	X													

Notes:

Surface soil samples have depth intervals that start within 3 feet of the surface, but don't extend deeper than 4 feet.

Five trench samples deeper than 4 feet are also included.

a - Sample was collected from LWG Beach sampling area B15.

b - These samples will also be evaluated as part of the East Parcel Upland Exposure Unit.

FIGURES

S:\GIS\ARCPRJ2\010116\PLT\WC_RRA\WC_RRA_APPROACH_JUN2012\FIG1_WCRRA_SITE_REV2.MXD

Legend

- Willamette Cove Upland Facility Boundary (MHWM - 13.3NAVD88)

Exposure Units

- West Parcel Upland Exposure Unit
- Central Parcel Upland Exposure Unit
- East Parcel Upland Exposure Unit
- Inner Cove Beach Exposure Unit
- Central Beach Exposure Unit
- Proposed Incremental Sample Decision Units
- McCormick and Baxter Cap
- Upland Removal Excavation Area
- OHWL (20.1NAVD88)
- MHWM (13.3NAVD88)
- OLWL (6.9NAVD88)

Beach Removal Action Features (2004)

- Concrete structure/wooden beam
- Removal Action Excavation

Map notes:
- Refer to memo for description of exposure units.
- Upland Facility Boundary is based on Voluntary Cleanup Agreement with Oregon, DEQ 2000.
- OHWL = Ordinary High Water Line; OLWL=Ordinary Low Water Line; MHWM=Mean High Water Mark
- Aerial photography: 2009

0 200 400 Feet

WILLAMETTE COVE UPLAND FACILITY
RESIDUAL RISK ASSESSMENT

FIGURE 1

EXPOSURE UNITS

DATE: JUN 15, 2012
BY: RCR FOR: MCL

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010116\PLT\WC_RRA\WC_RRA_APPROACH_JUN2012\FIG2_WCRRA_WESTP_REV2.MXD

Legend

- Surface soil samples
- Discrete samples indicated by: ♦
- Composite samples indicated by: +
- Willamette Cove Upland Facility Boundary (MHWM - 13.3NAVD88)

Exposure Units

- West Parcel Upland Exposure Unit
- Central Parcel Upland Exposure Unit
- East Parcel Upland Exposure Unit
- Inner Cove Beach Exposure Unit
- W. Central Parcel Beach Exposure Unit

- OHWL (20.1NAVD88)
- MHWM (13.3NAVD88)
- OLWL (6.9NAVD88)

Map notes:
- Refer to memo/tables for a description and summary of the soil samples within each exposure unit.
- Sampling locations obtained from materials provided by Ash Creek Associates.
- Upland Facility boundary is based on Voluntary Cleanup Agreement with Oregon, DEQ 2000.
- OHWL = Ordinary High Water Line; OLWL = Ordinary Low Water Line; MHWM = Mean High Water Mark
- Aerial photography: 2009

0 50 100 Feet

WILLAMETTE COVE UPLAND FACILITY
RESIDUAL RISK ASSESSMENT

FIGURE 2

WEST PARCEL SURFACE SOIL SAMPLING LOCATIONS

DATE: JUN 15, 2012
BY: RCR
FOR: MCL

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010116\PLT\WC_RRA\WC_RRA_APPROACH_JUN2012\FIG3_WCRRA_CENTPDOWN_REV2.MXD

Legend

- Surface soil samples - Upland Exposure Unit
- Surface soil samples - Beach Exposure Unit

Discrete samples indicated by: ♦

Composite samples indicated by: +

- Willamette Cove Upland Facility Boundary (MHWM - 13.3NAVD88)

Exposure Units

- West Parcel Upland Exposure Unit
- Central Parcel Upland Exposure Unit
- East Parcel Upland Exposure Unit
- Inner Cove Beach Exposure Unit
- Central Beach Exposure Unit

- OHWL (20.1NAVD88)
- MHWM (13.3NAVD88)
- OLWL (6.9NAVD88)

Map notes:
- Refer to memo/tables for a description and summary of the soil samples within each exposure unit.
- Sampling locations obtained from materials provided by Ash Creek Associates.
- Upland Facility boundary is based on Voluntary Cleanup Agreement with Oregon, DEQ 2000.
- OHWL = Ordinary High Water Line; OLWL = Ordinary Low Water Line; MHWM = Mean High Water Mark
- Aerial photography: 2009

N

0 100 200 Feet

WILLAMETTE COVE UPLAND FACILITY
RESIDUAL RISK ASSESSMENT

FIGURE 3

CENTRAL PARCEL AREA (DOWNSTREAM PORTION) SURFACE SOIL SAMPLING LOCATIONS

DATE: JUN 15, 2012

BY: RCR FOR: MCL

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010116\PLT\WC_RRA\WC_RRA_APPROACH_JUN2012\FIG4_WCRRA_CENTPUP_REV2.MXD

Legend

- Surface soil samples
- Proposed Incremental Sample Decision Unit
- Upland Removal Excavation Area

Discrete samples indicated by: ♦

Composite samples indicated by: +

- Willamette Cove Upland Facility Boundary (MHWM - 13.3NAVD88)

Exposure Units

- West Parcel Upland Exposure Unit
- Central Parcel Upland Exposure Unit
- East Parcel Upland Exposure Unit
- Inner Cove Beach Exposure Unit
- Central Beach Exposure Unit

- OHWL (20.1NAVD88)
- MHWM (13.3NAVD88)
- OLWL (6.9NAVD88)

Map notes:
- Refer to memo/tables for a description and summary of the soil samples within each exposure unit.
- Sampling locations obtained from materials provided by Ash Creek Associates.
- Upland Facility boundary is based on Voluntary Cleanup Agreement with Oregon, DEQ 2000.
- OHWL = Ordinary High Water Line; OLWL = Ordinary Low Water Line; MHWM = Mean High Water Mark
- Aerial photography: 2009

N

0 50 100 Feet

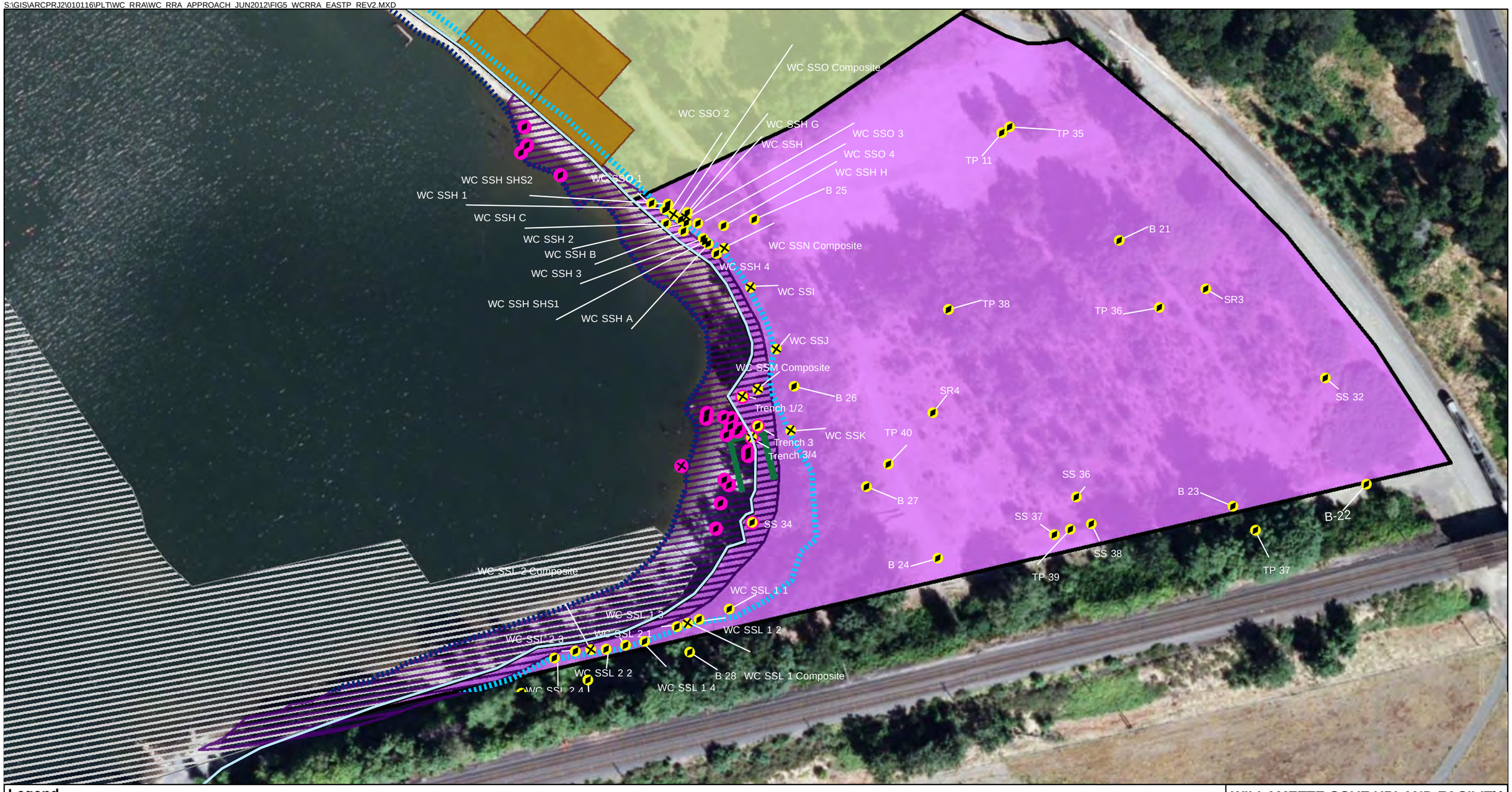
WILLAMETTE COVE UPLAND FACILITY
RESIDUAL RISK ASSESSMENT

FIGURE 4
CENTRAL PARCEL AREA (UPSTREAM PORTION) SURFACE SOIL SAMPLING LOCATIONS

DATE: JUN 15, 2012
BY: RCR FOR: MCL

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010116\PLT\WC_RRA\WC_RRA_APPROACH_JUN2012\FIG5_WCRRA_EASTP_REV2.MXD



Legend

- Surface soil (and trench) samples - Upland Exposure Unit
- Surface soil (and trench) samples - Beach Exposure Unit

Refer to Figure 6 for more details.

Beach Removal Action Features (2004)

- Concrete structure/wooden beam
- Removal Action Excavation

Discrete samples indicated by: ♦ Composite samples indicated by: +

Exposure Units

- West Parcel Upland Exposure Unit
- Central Parcel Upland Exposure Unit
- East Parcel Upland Exposure Unit
- Inner Cove Beach Exposure Unit
- Central Beach Exposure Unit

- Willamette Cove Upland Facility Boundary (MHWM - 13.3NAVD88)
- OHWL (20.1NAVD88)
- MHWM (13.3NAVD88)
- OLWL (6.9NAVD88)
- McCormick and Baxter Cap
- Proposed Incremental Sample Decision Unit

Map notes:
- Refer to memo/tables for a description and summary of the soil samples within each exposure unit.
- Sampling locations obtained from materials provided by Ash Creek Associates.
- Upland Facility boundary is based on Voluntary Cleanup Agreement with Oregon, DEQ 2000.
- OHWL = Ordinary High Water Line; OLWL = Ordinary Low Water Line; MHWM = Mean High Water Mark
- Aerial photography: 2009

0 100 200 Feet

WILLAMETTE COVE UPLAND FACILITY
RESIDUAL RISK ASSESSMENT

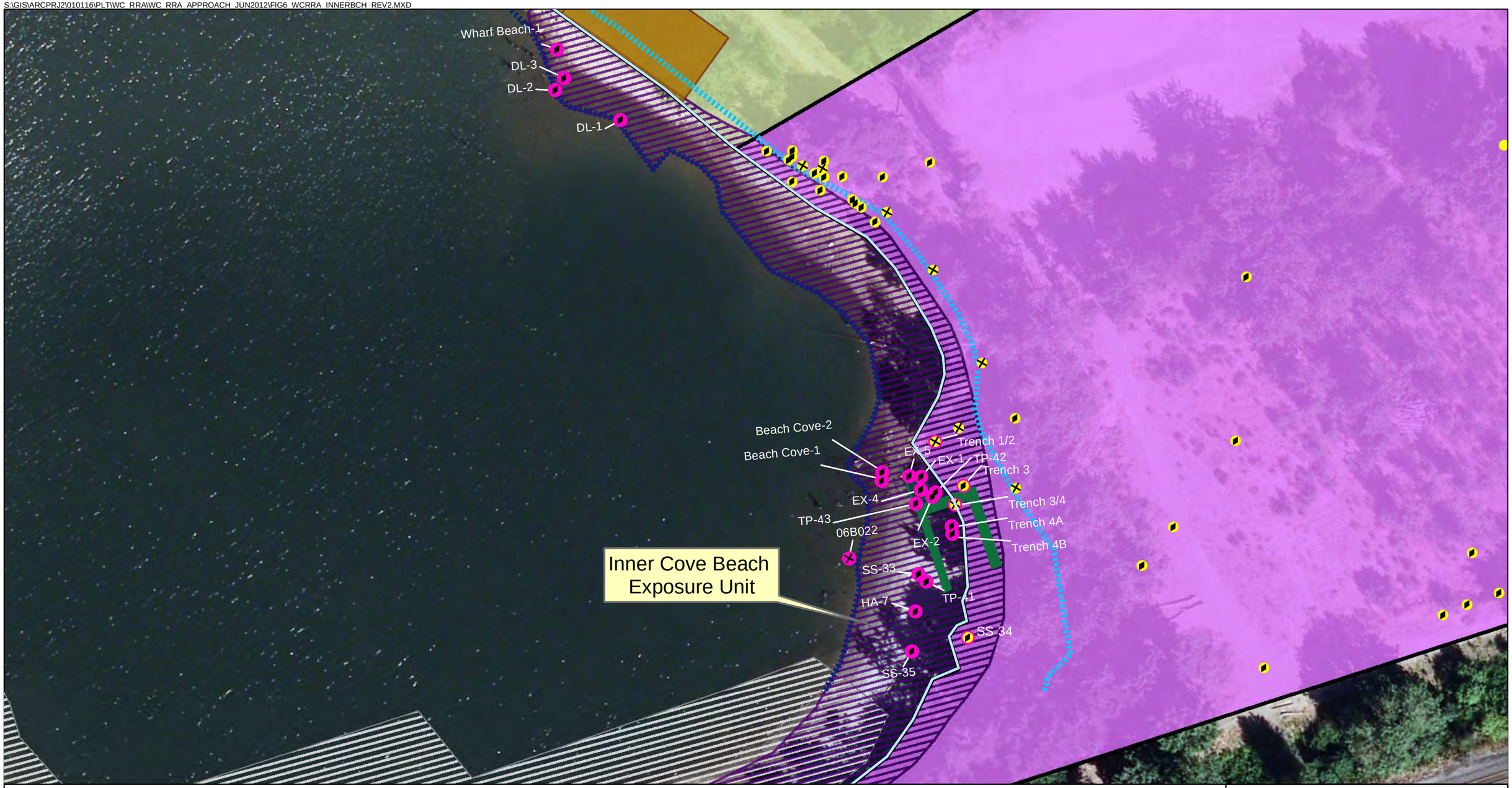
FIGURE 5

EAST PARCEL AREA SURFACE SOIL SAMPLING LOCATIONS

DATE: JUN 19, 2012
BY: RCR FOR: MCL

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010116\PLT\WC_RRA\WC_RRA_APPROACH_JUN2012\FIG6_WCRRA_INNERBCH_REV2.MXD



Legend

- Surface soil (and trench) samples - Upland Exposure Unit
  Refer to Figure 5 for more details.
- Surface soil (and trench) samples - Beach Exposure Unit

Beach Removal Action Features (2004)

- Concrete structure/wooden beam
- Removal Action Excavation

Discrete samples indicated by: ♦ Composite samples indicated by: +

Exposure Units

- West Parcel Upland Exposure Unit
- Central Parcel Upland Exposure Unit
- East Parcel Upland Exposure Unit
- Inner Cove Beach Exposure Unit
- Central Beach Exposure Unit

- Willamette Cove Upland Facility Boundary (MHWM - 13.3NAVD88)
- OHWL (20.1NAVD88)
- MHWM (13.3NAVD88)
- OLWL (6.9NAVD88)
- McCormick and Baxter Cap
- Proposed Incremental Sample Decision Unit

Map notes:
- Refer to memo/tables for a description and summary of the soil samples within each exposure unit.
- Sampling locations obtained from materials provided by Ash Creek Associates.
- Upland Facility boundary is based on Voluntary Cleanup Agreement with Oregon, DEQ 2000.
- OHWL = Ordinary High Water Line; OLWL = Ordinary Low Water Line; MHWM = Mean High Water Mark
- Aerial photography: 2009

0 25 50 Feet

WILLAMETTE COVE UPLAND FACILITY
RESIDUAL RISK ASSESSMENT

FIGURE 6

INNER COVE BEACH SURFACE SOIL SAMPLING LOCATIONS

DATE: JUN 19, 2012
BY: RCR FOR: MCL

FORMATION ENVIRONMENTAL